

A NEW APPROACH TO THE PROBLEM OF HUMAN EVOLUTION

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SUMMARY

The paper presents a brief survey of some of the best known human and near-human fossils to set out the difficulties they present in interpretation. A review of archaeological finds indicates that cultural attainments cannot be equated with physical or mental attainments and are no index of evolutionary development. The morphological characters of ancient physical types, particularly Neanderthal Man, are analyzed and shown to lie within the normal range of human variation. It is considered that the only distinguishing human feature is absolute and relative brain size, and that all the fossils considered, with the exception of the *Australopithecinae*, are simply variants of the normal human pattern. It is considered, further, that the present method of trying to trace human evolution by comparison of adult forms is futile. The only common stem that can be found for the primates lies in an early embryonic series. In this series a sufficiently generalized precursor for man could be produced by practically any of the primates. Consequently, it is unnecessary to go very far back into primate history to find the ancestral form.

INTRODUCTION

While the fact of human evolution is not in doubt there is still great uncertainty over the course which it has followed. Most writers agree that man's origin is associated with the primates, but which—if any—represents the directly ancestral form and who are his nearest relations today are still the subject of controversy. Wood Jones (1929) finds the common ancestry in shrews, Le Gros Clark (1949) traces an evolutionary sequence which starts with the shrews and passes ultimately through the Miocene apes and the *Australopithecinae*. Gregory (1934) postulates a common lemuroid ancestry for all modern higher primates and relates man closely to the great apes. There are many other possible schemes. The problem is to discover a primate sufficiently like man to be acceptable as a close relation, yet sufficiently generalized to qualify as a possible ancestor. The only satisfactory candidate so far discovered is man himself.

A further major problem is man's relatively late appearance on earth. His one million years or so is a small fraction of the 40 million years allotted to monkeys and apes or the 60 million for lemurs. On the traditional view the factors which went into making these animals must be associated with those which went into the making of man. Yet, despite considerable search, this great interval of time is not even within sight of being bridged.

The purpose of this paper is to show how much our thinking on human evolution has been constrained by a too naive conception of the Darwinian theory. It is felt that when this restrictive outlook is replaced by a broader biological approach many of the difficulties in the interpretation of human fossils will diminish or vanish altogether. In particular, it is hoped to show that a generalized human ancestor is not necessarily so remote as it sometimes seems to be.

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PREHISTORIC REMAINS

ANATOMICAL EVIDENCE

Here attention is directed almost entirely to a few of the most difficult of human or near-human fossils. Man is the only positive fact in human evolution, and all hypotheses involving other primates must remain suspect so long as the relationship of those primates to man is itself in doubt. However, reference to other primates is included in later consideration of the problem.

Australopithecinae—These were first described by Dart (1925) from the Taungs skull. Few anthropologists endorsed Dart's claim for human affinities for this skull (see Keith, 1929) and it languished until the discovery of similar material at Sterkfontein and Kroomdrai (Dart, 1940; Broom, 1946). In these creatures the skull has many anthropoid characters, including protruberant jaws, an exposed premaxillary suture and a brain within the anthropoid range (Schepers, 1946). On the other hand, the teeth are more human (Dart, 1925; Keith, 1929; Gregory and Hellman, 1939; Le Gros Clark, 1950a) and the forward site of the foramen magnum suggests an upright posture. The claim for an upright posture has been sustained by the hip bone, which is strikingly humanoid (Dart, 1949; Le Gros Clark, 1950b). The Taungs skull is rather doubtfully referred to the late Pliocene or lower Pleistocene, the Kroomdrai remains to the middle Pleistocene (Dart, 1940).

Pithecanthropinae—The discovery of *Pithecanthropus* by Dubois in 1891-2 (see Dubois, 1896) seemed to provide the anticipated intermediate form between ape and man, combining a simian type of calvaria with a human type of femur. Indeed, the mixture proved too strong for some to stomach and they postulated a more or less fortuitous association of human and ape remains. Later discoveries by von Koenigswald (see Weidenreich, 1945a), however, confirmed the original pronouncement and disclosed that the situation of the foramen magnum is consistent with an upright posture. *Sinanthropus*, discovered much later (Black, 1934) does not differ significantly from *Pithecanthropus* (Weidenreich, 1940a; Le Gros Clark, 1945). Both have been assigned to a period between lower and middle Pleistocene in age.

Neanderthal Man—Until the discovery of *Pithecanthropus* Neanderthal Man provided the nearest approach to the expectations of evolutionists. His low brow, heavy eyebrow and occipital ridges, backwardly-displaced foramen magnum, prominent jaws and small mastoid process, together with a femur and calcaneum which betokened a shambling gait, all fitted into the picture so nicely. In 1864 King named the creature *Homo neanderthalensis* and Schwalbe and others assigned him to an entirely distinct human species. Neanderthal Man proper belongs to the lower part of upper Pleistocene horizons.

Pittdown Man—This skull, too, presents a curious *mélange* of simian and human features. The most recent reconstructions (Elliot Smith, 1927; Keith, 1929, 1938) indicate a modern type of cranium with a good mastoid process but no great development of supraorbital and occipital ridges. On the other hand, the teeth possess simian characters and the mandible betrays some evidence of a "simian shelf". The usual controversy over whether or not the remains all belonged to the same individual has been virtually disposed of by the fluorine method (Oakley, 1950). Oakley puts this fossil between middle and upper Pleistocene.

While each of these groups might be considered a step in the evolutionary advance towards modern man, each presents points of difficulty. Ignoring the possibility of chronological overlap, *Australopithecus* and *Pithecanthropus* could conceivably represent successive stages, but Neanderthal Man—their

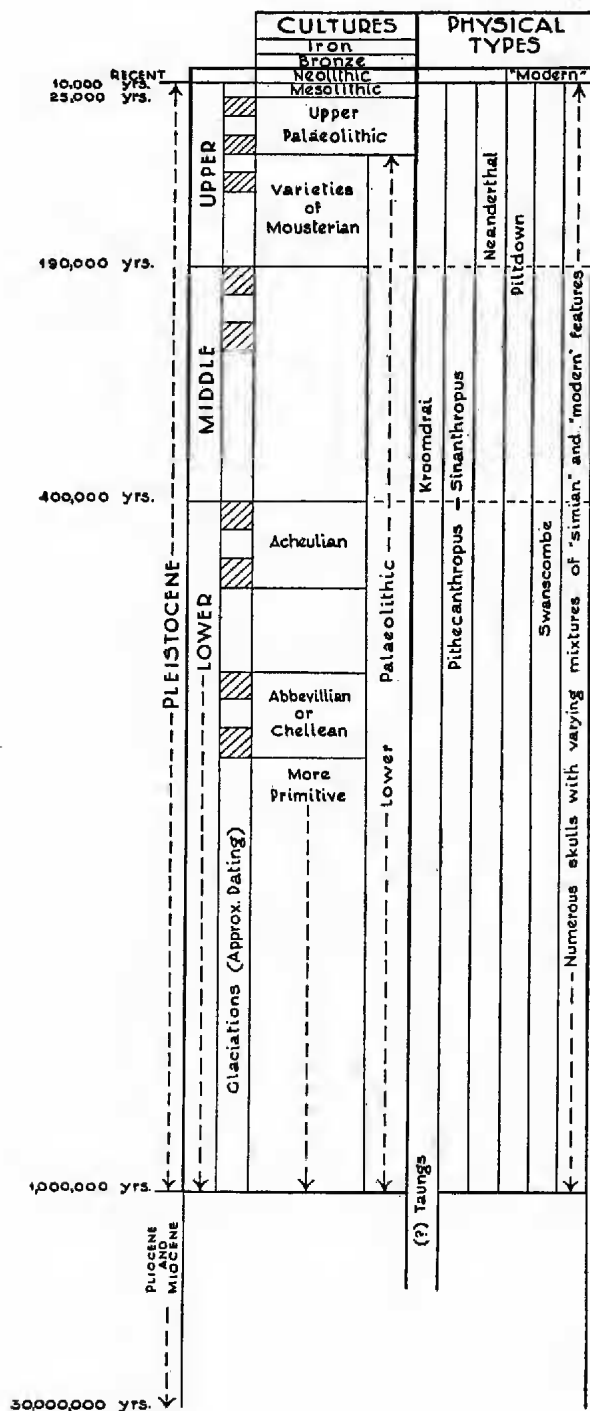


TABLE OF
QUATERNARY
CHRONOLOGY
AS RELATED
TO CULTURES
AND PHYSICAL
REMAINS
(in part after Zeuner)

Fig. 1

Simplified outline of Quaternary chronology.

heir presumptive—is considered not to have had an erect posture and so is disqualified from inclusion in a series between erect *Pithecanthropus* and erect modern man; also, he occurred too late, overlapping ancient examples of modern man (fig. 1). Piltdown Man, too, mixes simian and human characters, but he also occurred too late to be considered ancestral to modern man. In fact, practically every hominoid fossil presents some physical or chronological discrepancy, and it is little wonder that many anthropologists have despairingly assigned them all to specialized offshoots from some common generalized stem which has progressed undeviatingly up to modern man.

That common stem unfortunately remains purely hypothetical, for it has not produced a single convincing example. Nevertheless, it seems likely that there is a common stem and a suggestion is presented later. But in this conception the representatives of the stem appear altogether different from those usually visualized by evolutionists.

ARCHAEOLOGICAL EVIDENCE

For Europe, workers have now established a fairly clear and orderly sequence of stone implement evolution (e.g., Peyrony, 1927; Capitain, 1931; and others), often referable to specific geological horizons (see Zeuner, 1950). In many instances, however, cultures overlap, intermingle or seem displaced from the accepted chronological order, and the problems posed by these non-conformities are far from being solved.

In only a few cases have distinctive cultures been decisively associated with human remains (fig. 1). The Swanscombe skull may now be assigned with fair confidence to a lower Pleistocene horizon containing Acheulian implements (Oakley, 1938, 1950). Neanderthal remains are referred to the Mousterian cultures of the early upper Pleistocene. But from the end of the lower Palaeolithic all cultures are associated with human remains indistinguishable from those of modern man. Since the Swanscombe skull is also indistinguishable from that of modern man (Le Gros Clark, 1938; Morant, 1938) the sole problem of physical anthropology in Europe at present centres around Neanderthal Man. Indeed, Neanderthal Man has so hypnotized anthropologists that—as Keith (1929) and Leakey (1950) have complained—modern-type skulls found in ancient strata are often automatically dismissed as intrusions. In fact, European anthropology might almost be described as “Neanderthalology,” for no findings outside the Neanderthal offer any serious difficulty.

Despite the accumulation of much detailed information, the positive contribution to our knowledge of man in Pleistocene times is very meagre. This information relates mainly to central and western Europe, with some extensions to Africa and the Near East. Even in western Europe the geological-archaeological association is not always conformable to the accepted plan, while in eastern Europe the correlation begins definitely to fail (Zeuner, 1950). Consequently, as Zeuner has emphasized, there is little present justification for extending to more distant parts of the world—e.g., eastern Asia or Australia—a chronology based upon the geological succession in a relatively restricted region. Similar geological formations elsewhere are not necessarily contemporaneous.

There is an unfortunate tendency to confuse geology, archaeology and physical anthropology, and to describe one in terms of the other. Thus, a geological horizon may be referred to as “Acheulian” or “Aurignacian”. Much worse is the confusion of physical characters with cultural findings. Such terms as “Chellean Man” or “Levalloisian Man” are commonly employed, with the implicit assumption of a distinct physical type to be associated with the artifacts he left behind. Even Zeuner (1950, p. 164) sins

here when he tries to fit cultural remains to a supposedly Neanderthal hand found in the Crimea (see also his discussion on p. 304). Actually, the sole claimant to physical distinction so far discovered in Europe is Neanderthal Man, who is related, more or less legitimately in a relatively restricted region only, to the Mousterian culture series. But there is no guarantee that Neanderthal Man invented the Mousterian culture or that other peoples, who did not resemble him at all, did not use it. Further, there is no evidence that similar cultures are (or were) everywhere contemporaneous. The "Iron Age" culture Europeans who first explored the Pacific found modern-type men in Melanesia and Polynesia in a Neolithic phase, others similar in Australia in a late Mesolithic phase (Abbie, 1951), and yet others in Tasmania in a phase so primitive as almost to defy classification. Clearly, it is as gross an anthropological crime to equate culture with physical characters as it is to equate language with physical characters.

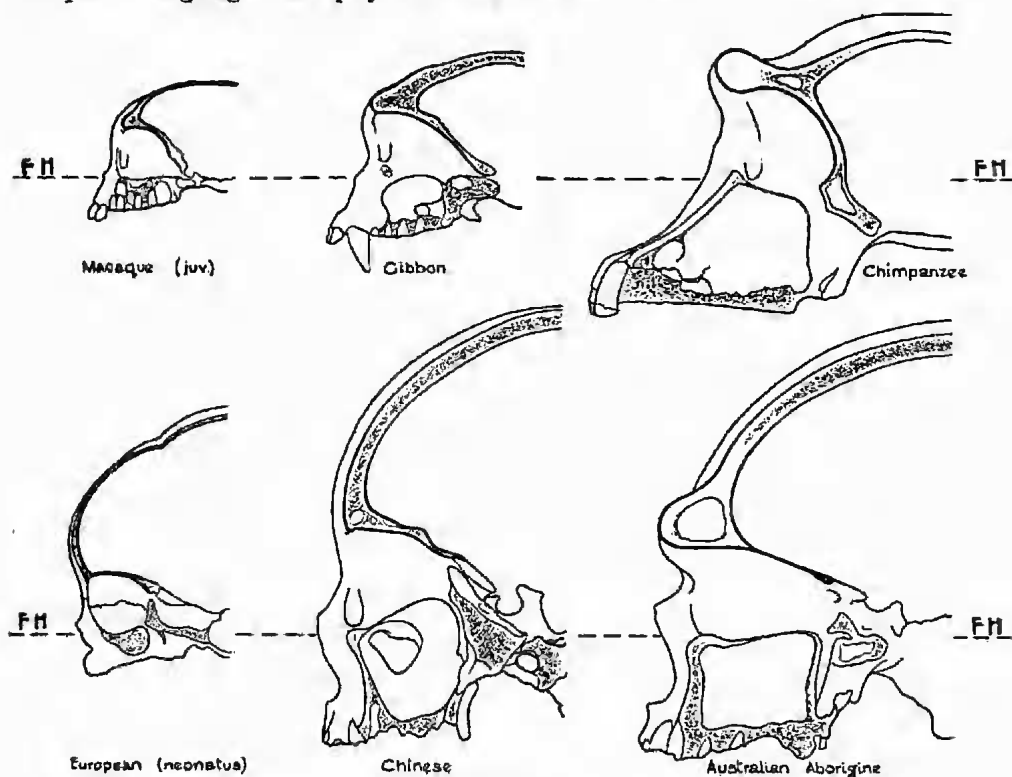


Fig. 2

Sections through the orbital region of various skulls to illustrate the part played by the supraorbital ridge as a roof to the orbit. (F. H. = Frankfurt Horizontal.)

RE-EXAMINATION OF MORPHOLOGICAL CRITERIA

Weidenreich (1946a, p. 201) has pointed out that the tendency to minute sub-classification of fossil man complicates the problem to the point where the leading line of evolution is lost and only singular forlorn specimens remain. The best way to simplify the problem appears to be to discover to what extent the physical non-conformities, i.e., the "simian" features, in human remains are incompatible with the "human" features in the same remains. In other words, it is necessary to determine whether the normal range of human variation is wide enough to embrace the so-called "simian" features.

Since the outstanding event in European physical anthropology of Pleistocene times was the apparently unique intrusion of Neanderthal Man no substantial progress can be made before he is set in his proper perspective. Most of the data for this are craniological.

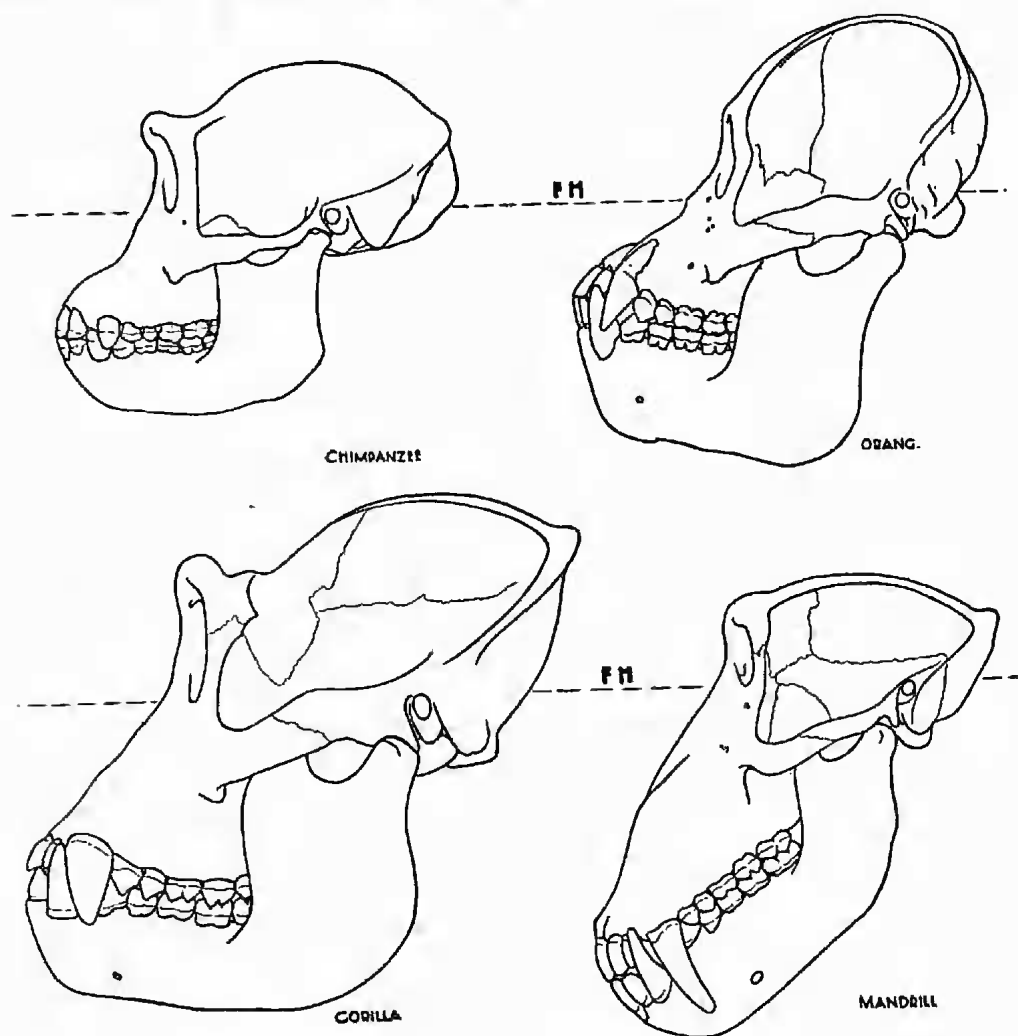


Fig. 3

Primate skulls to illustrate the inconstant relationship between jaw size and size of supraorbital ridge. Note also the combination of facial and alveolar prognathism.

NEANDERTHAL MAN

The Brain—According to Hechst (quoted by Le Gros Clark, 1937) a brain as small as 788 cc. has functioned in the normal human fashion. And it would appear that any brain from about 800 cc. to nearly three times as much, may be compatible with human behaviour. As is well known, the brain of Neanderthal Man falls well within these limits. Much of the length of Neanderthal skulls is due to prominent supraorbital and occipital tori. The endocranial index is much higher than the ectocranial index (Weidenreich, 1945 b; Abbie, 1947) and the shape of the Neanderthal brain is well within existing human proportions. Incidentally, most of the energy spent upon trying to deduce cerebral characters from endocranial casts has proved

wasted effort. Symington (1916), Le Gros Clark, Cooper and Zuckerman (1930) and Packer (1949) have all shown that primate casts give little more than maximum dimensions and general proportions. Detailed analysis such as Schepers (1946) attempts for the *Australopithecinae* can have very little value in the present state of our knowledge.

Supraorbital Ridges—The size of these ridges plays an important part in determining whether a skull has a simian appearance or not. Large ridges give a lowering appearance as well as accentuating the slope of the forehead (fig. 5). While large ridges are often associated with large jaws that is not always so, nor, despite widespread belief on the subject, is the primary purpose of such ridges to support heavy jaws and jaw muscles. Bolk (1922) showed that in primates where the face protrudes in front of the skull the eyes no longer lie under the cranial cavity and would be unprotected above unless the frontal bone extended forwards to cover the orbits (fig. 2). The first development of the ridges is, then, related to protrusion of the muzzle but in many primates, e.g., *Hylobates*, *Papio*, the ridges remain little more than a thin roof to the orbit, which is sometimes almost funnel-shaped as in *Hapale* and *Tarsius*. Certainly in the gorilla the ridges are very massive and are associated with very massive jaws (fig. 3), but even the gorilla shows a wide range of variation (Schultz, 1940). The chimpanzee and orang also have proportionately large jaws but the ridges are much less prominent. The orang, indeed, with more massive—but less protuberant—jaws than the chimpanzee, has relatively inconspicuous ridges. Yet more striking, the mandrill has very protuberant jaws and strong associated musculature but the ridges are little more than terminal thickenings of a thin orbital roof. The Miocene apes of East Africa also combine prominent jaws with very little ridge formation (Le Gros Clark and Leakey, 1951). However, the fact that both the orang and the Miocene apes combine very protuberant jaws with almost no ridge formation indicates that Bolk's views do not provide a complete explanation for the ridges.

In hominids a similarly mixed association can be shown. The *Pithecanthropinae* had both large ridges and large jaws. But Broken Hill Man, with ridges as large as the gorilla, had much smaller jaws, while Piltdown Man, with no particular ridge development, had simian-type teeth and jaws. Not all Australian aborigines are markedly prognathous (fig. 5), but even in those which are the development of the ridges varies widely and the brow ranges from an almost purely Neanderthal type to an upright smooth forehead of which any European could be proud (Abbie, 1951). The aboriginal skull described by Burkitt and Hunter (1922) combined a Neanderthaloid calvaria with facial orthognathism and alveolar prognathism. Negroes are typically prognathous but lack any marked ridge formation. Europeans and other ethnic groups also show a wide range of ridge development associated with an equally mixed assortment of jaws. On the other hand, the low retreating forehead of Lord Darnley had little supraorbital formation (Pearson, 1928).

Clearly, the size of the eyebrow ridges can vary independently of jaw size, and it is not possible with certainty to infer from any given calvaria what the jaws were like or from any set of jaws what the calvaria was like (fig. 5). It was failure to recognize this fact that led to the controversy over the Piltdown remains. It has been shown on statistical grounds that there is no correlation between shape of head and size of jaw (Abbie, 1947). Even without statistical support it seems equally clear that there is no correlation between ridge size and jaw size. In other words, these features vary independently.

Occipital torus—This has been considered in detail by Weidenreich (1940 b). He points out that the human torus is not a purely muscular marking like the nuchal crest of the gorilla and he believes that the torus, together with the zygomatic arches and supraorbital ridges, provides a strong buttress round the base of the skull to withstand the thrust of massive jaws and their musculature. His opinion cannot be accepted without some reserve. As already noted, there is no necessary relation between size of jaws and supraorbital ridges; nor does the view account for the absence of a torus in Piltdown Man, despite the apparently simian jaws. And what role does the nuchal crest of the gorilla play in this context?

Mastoid Process—A small process is considered a simian character, a large one more human. This cannot be wholly true: in the gorilla the process shows a wide range of variation (Schultz, 1950) and the same applies to other anthropoids (fig. 4A). While small processes are common in the Australian aborigine there is a wide range up to as large as in any European (fig. 4B). Moreover, a small process may be associated with either a small or a large occipital crest, and similarly for a large process.

Jaws and Teeth—Protuberant jaws are considered an anthropoid character, straight jaws human; but there are all intervening grades.

Facial prognathism is produced by elongation of the jaws as a whole, alveolar prognathism depends mainly upon protrusion of the anterior teeth and the alveolar margins. Frequently the two kinds are combined—as typically in the Neanderthaloid, Australian aborigine and negro—but this is not always so (Burkitt and Hunter, 1922; Parsons, 1930). In primates, at least, true facial prognathism depends mainly upon the antero-posterior length of the crowns of the lateral teeth—molars, premolars and often the canines (figs. 3, 4C, 6). Long teeth require long jaws to house them.

Alveolar prognathism is rather more complicated. In apes it depends to some extent upon the size of the canines and their associated diastemata. That is not an important factor in the human, even though a maxillary diastema has been described for *Pithecanthropus* IV (Weidenreich, 1946 a) and for a modern negress (Schultz, 1948).⁽¹⁾ At least one contributory cause in the production of alveolar prognathism appears to be a discrepancy in the size of the intra- and extra-alveolar portions of the teeth. Narrow roots widening to broad crowns will produce a splaying out of the alveolar region, both laterally and frontally (fig. 4C, gorilla). This involves mainly the canine-incisor series, with more or less acute alveolar slope according to the degree of crown-root discrepancy. In the mandible the symphyseal slope might well amount to a "simian shelf". Since tooth size varies independently of jaw size (Begg, 1939), varying grades of dental disproportion will produce corresponding grades of alveolar prognathism. Several such grades are found in the Australian aborigine, with reciprocal degrees of prominence of the chin (fig. 4C).

The Heidelberg mandible, which some consider belongs to the Neanderthal series, can now be matched by "modern" human examples, both ancient and recent (Keith, 1913; Weidenreich, 1943).

Taurodontism—This was considered a specific peculiarity of Neanderthal Man (see Keith, 1929), occurring in all grades from a minor enlargement of the molar pulp cavity up to its "typical" condition. However, early degrees of taurodontism have since been described in a South African fossil as well as in some of the Palestinian remains (Keith, 1931). According to Weidenreich (1943) taurodontism has also been found in orangs and in Esquimaux. It appears occasionally in modern white man (pl. v). On the other hand,

⁽¹⁾ Also recently observed by the writer in a living aborigine.

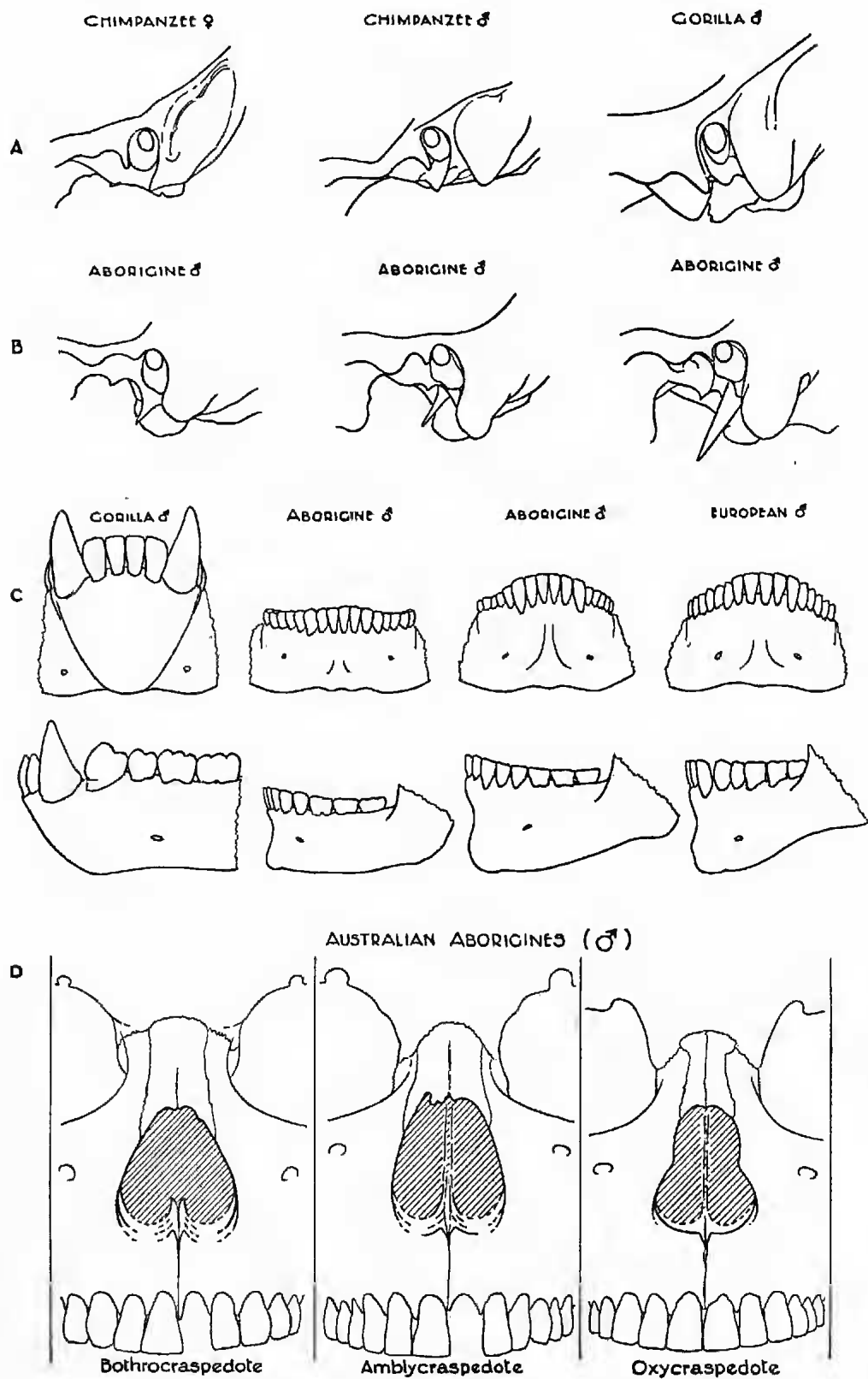


Fig. 4

(See bottom of facing page for description)

one of the most "typical" of Neanderthal skulls—La Ferrassie—betrays no evidence of taurodontism (Boule, 1923).

Analysis of Campbell's (1925) observations indicates that the crown pattern of Neanderthal molars does not differ significantly from that of the Australian aborigine. There is no evidence that this, in turn, differs significantly from that of the European. Consequently, there is no reason to believe that in any particular the molar teeth set Neanderthal Man specifically apart from the rest of humanity (see Coon, 1939, p. 25).

Narial Margin—This presents an outstanding non-conformity in Neanderthal Man since he is typically as oxycraspedote as the modern European (Keith, 1929), irrespective of any "simian" characters the rest of the skull may betray. The Australian aborigine presents all grades from an almost "simian gutter" to an almost European condition (fig. 4D), again irrespective of the presence or absence of "simian" features elsewhere. A similarly mixed association can be found in the skulls of other peoples and it seems clear that the formation of the narial margin varies independently of the remainder of the skull.

Foramen magnum—A relative backward displacement of the foramen magnum described for some Neanderthal skulls was considered evidence for a stooped, shambling gait. However, Sergi (quoted by Weidenreich, 1947) has shown that there is no evidence that the position of the foramen in Neanderthaloids taken over all differs significantly from that in modern man. In the so-called Dinaric types of modern Europe (Coon, 1939) both the ears and the foramen magnum are placed relatively posteriorly, yet the Dinarics are as upright as any other Europeans. The argument for a Neanderthaloid peculiarity in posture and gait thus loses much of its force.

General—With the possible exception of Heidelberg Man, Neanderthal Man's predecessors were less ape-like than he. Swanscombe Man is indistinguishable from modern man, while the Stenheim and Ehringsdorf remains are merely "Neanderthaloid". The same applies to the Tabūn and Galilee skulls of Palestine (McCown and Keith, 1939) and to the Solo and Wadjak skulls of Java. Coon (1939) describes Neanderthaloid characters in upper Palaeolithic, modern-type, skulls, Burkitt and Hunter (1922) have done the same for a recent aboriginal skull, while the recent European Gardarene skulls (Keith, 1931) are remarkably Neanderthaloid. Further, skulls which betray many "Neanderthal" features can be seen today in any European community. In fact, both before and since the Neanderthal series, and also running parallel with it, are all forms intermediate between it and the "modern" type. Under the circumstances there seems to be no justification for distinguishing Neanderthal Man as a separate species, or for Coon's (1939) view that the intermediate grades, e.g., in Palestine, are the result of interbreeding between Neanderthaloids and moderns. On the contrary, the only conclusion justifiable is that Neanderthal Man, even in his extreme form, is no more than a local specialization within the normal range of human variation. This is in harmony with Weidenreich's (1943) view.

DESCRIPTION OF FIGURE 4.

- A. Various sized mastoid processes in anthropoids.
- B. The same in Australian aborigines.
- C. Gorilla's mandible to illustrate alveolar prognathism; two extremes in the aboriginal series; a European for comparison.
- D. The narial margin in Australian aborigines to illustrate the wide range.

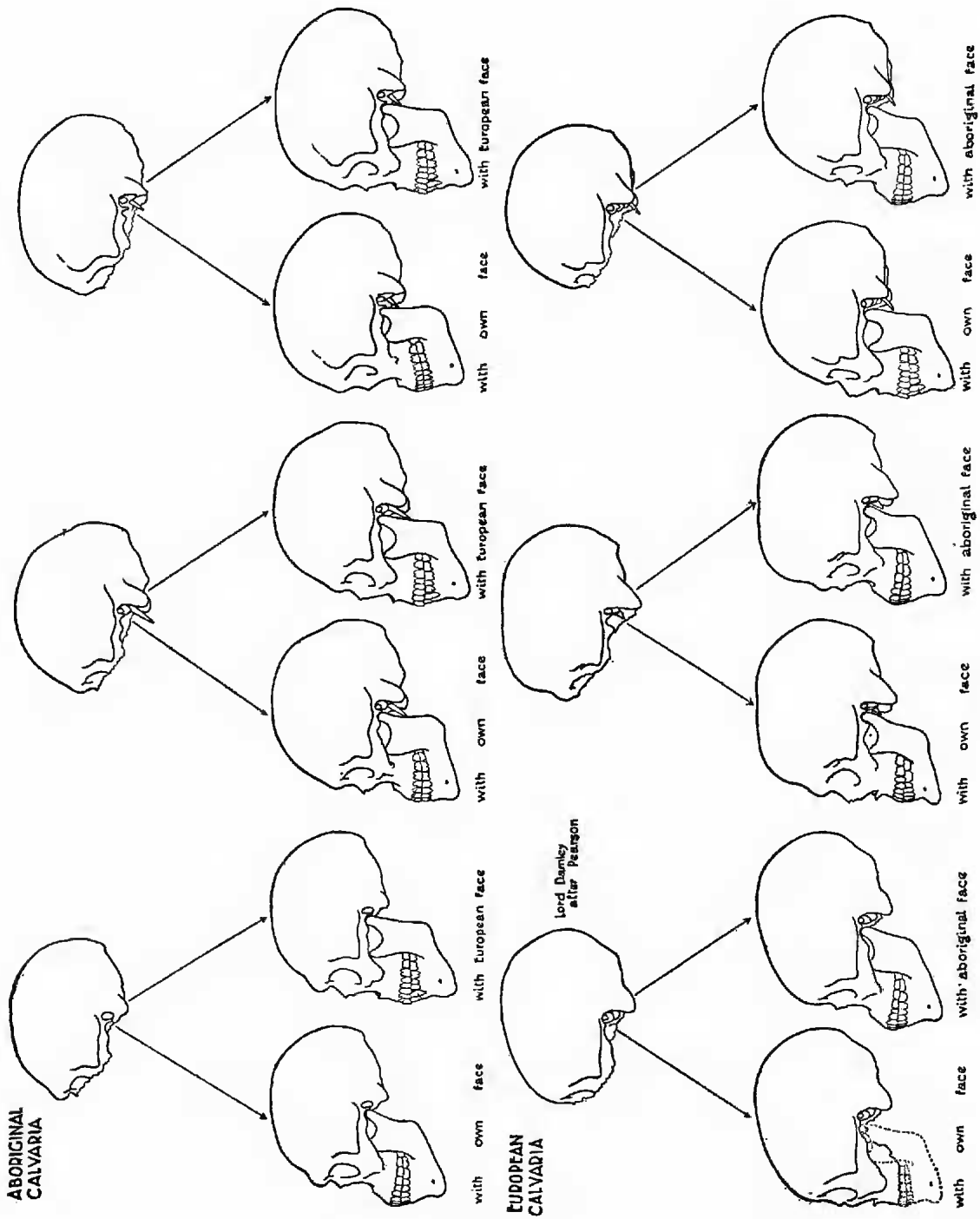


Fig. 5

One aspect of the cranial mosaic-interchanging faces and calvariae. Any of the combinations is possible and they indicate the danger of attempting to reconstruct faces from calvariae or calvariae from faces.

THE PHYSICAL MOSAIC

There is growing evidence that the skull is composed of a mosaic of features which, within wide limits, can vary independently of one another. That is the case with head length, head breadth and size of jaws (Abbie, 1947). The maximum head breadth, in turn, may be either frontally as in Basques or in the parietal region as is more common. It also appears that head height can vary quite considerably in skulls of the same cranial index (see Coon, 1939, p. 127). And it has been noted that tooth size and jaw size vary independently. The present survey indicates that nasal margins, supraorbital ridges, occipital ridges and mastoid processes also vary independently.

All this is perfectly intelligible on the particulate theory of inheritance—each feature being determined more or less independently by its own special gene or genes (Dobzhansky, 1937; Huxley, 1942). The most reasonable interpretation seems to be that these developments depend more upon differential growth processes than upon evolutionary or functional factors. When such features attain exuberant proportions it appears best to regard them simply as examples of extreme differentiation carrying normal lines of development to excess, but such excess need not affect all possible points equally or simultaneously.

What applies to the skull applies equally to the rest of the body. That, too, appears to comprise a mosaic of independently variable features held together in only loose harmony. There is plenty of evidence for such independent general variation in the works of Davenport (1926), Krogman (1941) and others. The association of physical characters in a wide variety of permutations and combinations, and the fixation of more stable associations under conditions of initial isolated inbreeding in particular environments, account adequately for both the wide range of human variation and the incidence of more or less distinctive ethnic groups.

Evidently, if these features are normal individually they are equally normal in combination. It is, therefore, of no moment if several such features occur simultaneously in a single person to give a rather more ape-like appearance than is considered customary for "modern" man.

An apparently incongruous assemblage of physical characters proves a stumbling block only to those obsessed by too rigid a preconception of what the line of human evolution should have been. The principle of "correlation of parts" serves well enough when comparing animals of different orders or genera, but it is only misleading when applied to minor differences of degree within what appears to be a single species. Any individual physical feature may appear anomalous in some setting, but provided the feature itself falls within the normal range of human variation there is no reason why it should not form a normal component of any human physical pattern.

Many of the difficulties of interpreting human fossils have arisen from comparing an isolated extreme example with a modern mean; comparison with a modern range of variation would have disposed of some of those difficulties. This point is made by Schultz (quoted by Weidenreich, 1946b) and by Weidenreich himself. It is becoming increasingly apparent that a so-called "ethnic type" is no more than a statistical assemblage of independent variables of which there is rarely any single complete concrete example. Unless a more flexible approach is adopted physical anthropology will qualify with chemistry as "the science of things that don't exist".

Taking these considerations into account it will be seen that there is no reason why the anthropoid *Australopithecus* should not have humanoid teeth

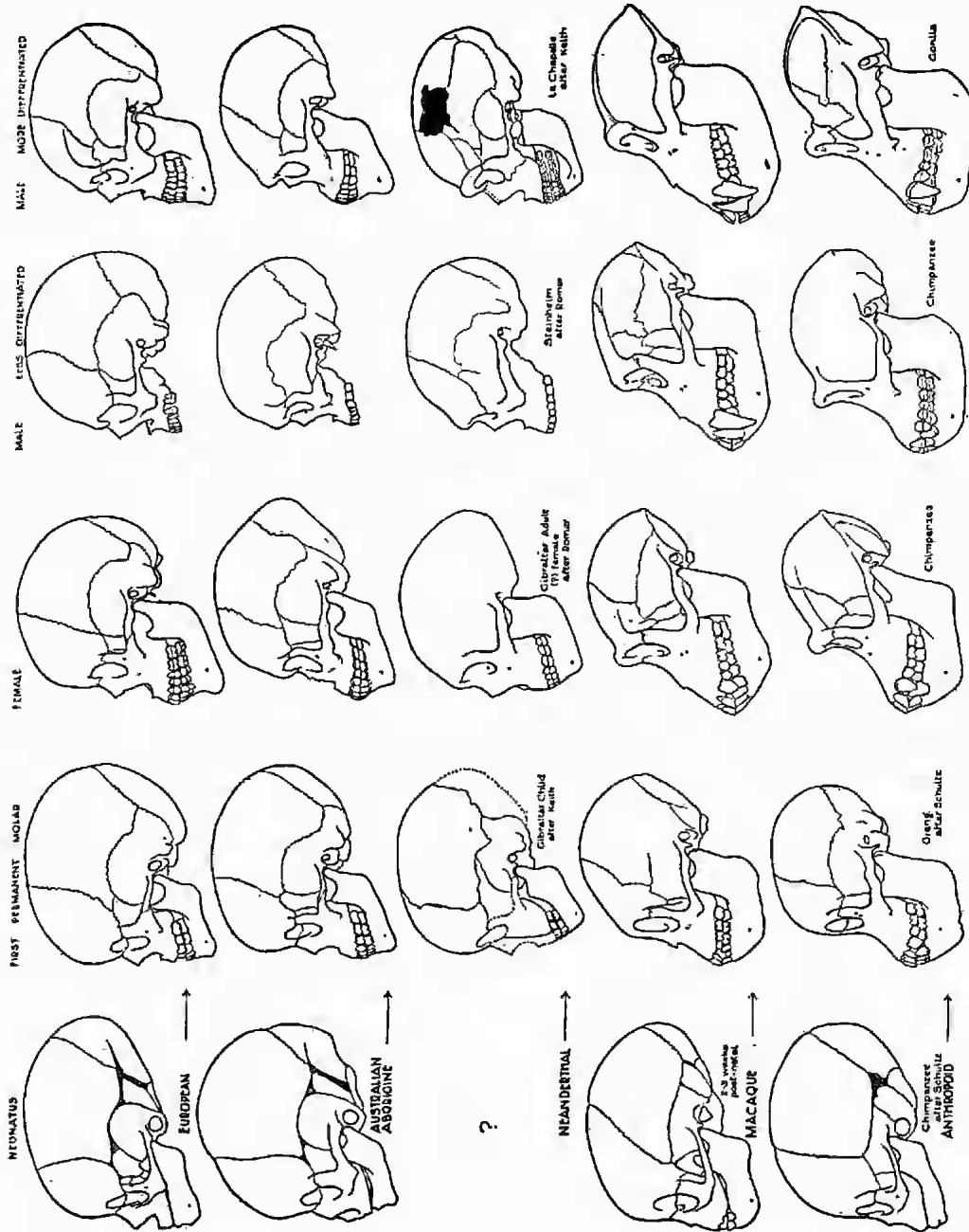


Fig. 6
Primate skulls to show how they differentiate to varying degrees from a relatively common neonatal form. To facilitate comparison they are all drawn to approximately the same size. The female chimpanzee is from a second-molar skull kindly presented by Dr. Adolph Schultz.

and limbs or why the human Piltdown skull should not have anthropoid jaws and teeth. Equally, there is no reason why the more anthropoid skull of *Pithecanthropus* should not be associated with a human-type femur or the less anthropoid skull of Neanderthal Man with a more simian-type femur. This renders rather futile such debates as to whether or not the Grimaldi remains are negroid and Chancelade skull esquimoid. Both can be matched within the Australian aboriginal range—and probably within other ranges—of human variation.

Apart from the whale and the elephant man has the largest brain known, and apart from the marmoset—*Hapale*—he has the highest brain/body-weight ratio. The combination of these two factors appears to provide the necessary neural substratum for the wide range of socio-economic variability that distinguishes man above all other animals. When, therefore, we look for something distinctively human we look for a primate with a cerebral capacity of 800 cc. or more. That includes all the disputed examples of humanity except the *Australopithecinae*. With that possible exception we have no right to consider any recognised hominid as being anything else but human, without any specific—much less generic—distinction. Within that cerebral range, too, there is no warrant to regard any individual or group as necessarily of a higher or lower order of mental ability.

A POSSIBLE COMMON STEM

At present the most we can say about early man is that he probably appeared first in the lower Pleistocene and that every example found so far had a cranial capacity above the required minimum. We know that some kinds had more anthropoid characters—particularly in their skulls—others less (although this fact appears to have little ethnological significance). We know, too, that on a statistical basis man has shown a more or less steady increase in mean stature and decrease in mean head length. On the cultural side we have evidence of a fairly progressive environment control which started slowly but has steadily accelerated up to the present day. That, however, is all we know with certainty in our search for clues to the factors behind evolution.

Two possible clues emerge. One is the progressive increase in stature and in brachycephalization, the other is the progressive control of the environment. There is now ample evidence for the increase in stature (see e.g., Le Gros Clark, 1945) and there is abundant evidence that such an environmental improvement as better nutrition can effect such physical improvement, even within a few years (see e.g., Le Gros Clark, 1939; Abbie, 1946, 1948a). The same applies to immigrants to a more favourable environment (Boas, 1940; Shapiro, 1939). Boas, Shapiro and others have also shown that environmental improvement produces alteration in head shape. Analysis of this alteration indicates that the change is towards a mean cranial index within the foetal range of 78-82 (Abbie, 1947). On the evolutionary time-scale there is evidence that these physical changes have been most apparent in those peoples who have made most progress in controlling their environment.

Progressively longer retention of the foetal form of skull is an example of the foetalization first described by Bolk (1926). Other human examples are the relative lack of hair and the lack of pigment which characterizes some human ethnic groups (de Beer, 1940). Increase in stature, which connotes an extension of the foetal capacity for growth, is also an expression of foetalization—even though the outcome is further removal from the foetus

physically. The concept of foetalization makes it necessary to reverse the usual ideas on human evolution.

A glance at the foetal skulls of most primates shows how essentially similar they all are, with smooth round crania and small jaws (fig. 6). Such primates as the gorilla, which subsequently develop large jaws and teeth and heavy supraorbital and occipital ridges, have differentiated farthest away from the foetal standard ("gerontomorphism"). Those, such as man, which show a progressively stronger tendency to retain the smooth skull and small jaws have differentiated least ("paedomorphism"). Anthropoid characters are, then, not primitive but specialized: the less anthropoid the characters the more primitive and less specialized they are (see Wood Jones, 1931). Evolution up to man has not been marked by a progressive reduction of simian features as is usually assumed; it is distinguished simply by failure to attain the simian degree of differentiation in a number of physical characters.

Not all modern human physical characters are foetalized, of course. A highly-arched nose, large mastoid process, prominent chin and the human foot are quite the reverse. Nevertheless, it is apparent that foetalization underlies most of the major elements characteristic of human evolution. Mere prolongation of the growing period permits an increase in overall dimensions which, up to an optimum that is still uncertain, confers a definite advantage in the struggle for existence. Even more important, such prolongation of the growing period allows the brain to acquire dimensions considerably greater than in any other primate (Abbie, 1948 b). Moreover, retention of the foetal form of skull provides the maximum cranial capacity with the minimum expenditure of bony material (Abbie, 1947).

Pursuit of the concept of foetalization casts an interesting light upon the problem of human origins. If all primate foetuses are so alike, at what stage do they become distinguishable from one another? In other words, how far back into foetal existence must one go to find an indifferent common generalized form that might become any kind of primate?

If a common generalized foetal form could be discovered the problem of man's ancestry would be much closer to solution than it is now. Purely as a working hypothesis, such a form is visualized here as resembling a human embryo of about seven weeks' gestation (fig. 7). At that stage the total development is that of a generalized primate and, while the digits of the hand are differentiated, those of the feet are not, so that there is no external indication whether the great toe will become free and appposable as in apes or remain fixed and adducted as in man. Although there is inadequate information on other primate embryos it seems likely that they all pass through such a stage. While it is true that the ultimate fate of this embryo is already determined at conception, it is equally true that a minor shift in emphasis could direct differentiation into any of the lines that end up each in its own specific kind of primate.

This is probably a gross over-simplification of the problem, but it serves to illustrate the thesis advanced here, namely, that a common ancestry for the primates is to be sought amongst primate embryos, not adults. And if there are different kinds of humans—which appears unlikely—then their common ancestry is to be sought in the same source. That is merely an extension of von Baer's modification of the Meckel-Serres law. If it is correct man's ancestry and affinities are not to be found by comparison of primate adult characters, and it is irrelevant to the problem whether man's adult physical make-up lies closer to the shrews, tarsiers, lemurs, monkeys, apes or any other that could be thought of. Theoretically, any of these

could by some embryonic twist have given rise to the human stock at any time. Consequently, there is no pressing need to go really far back into primate ancestry to discover a form sufficiently generalized to have given rise to man.

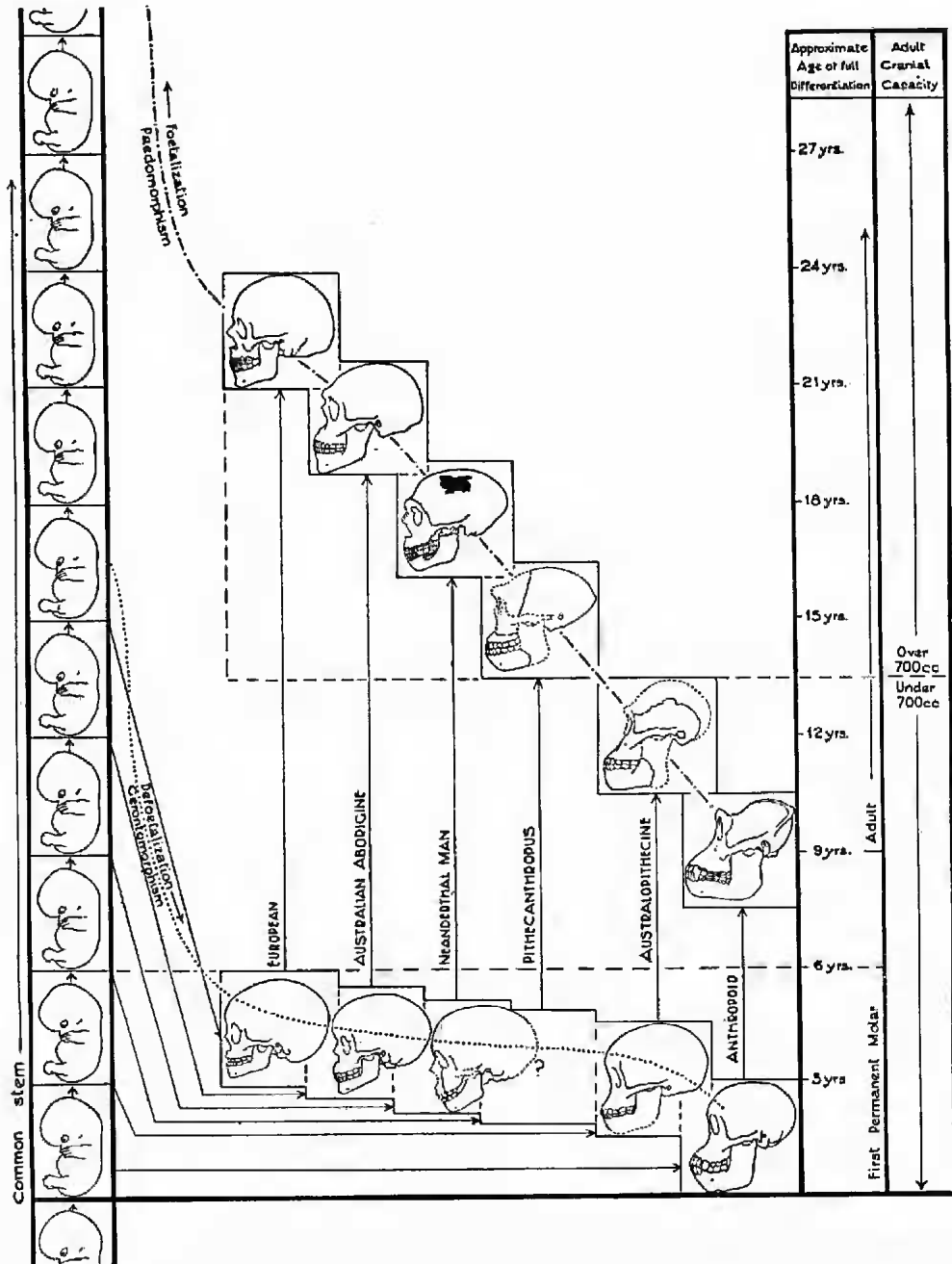


Fig. 7

A scheme to illustrate the suggested common primate stem, and the manner in which distinctive forms of various primates have been derived from it by a combination of the processes of gerontomorphism and paedomorphism.

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